

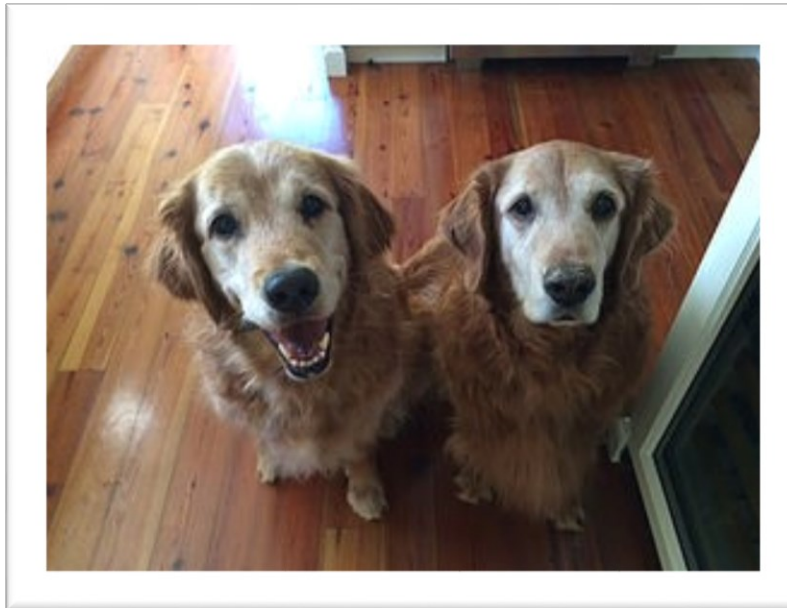
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# **No Bones About It: How Dogs Can Help Advance Cancer Research**

Greenwich Public Library Meeting Room

*101 West Putnam Ave*

**May 19 at 7:00 pm**

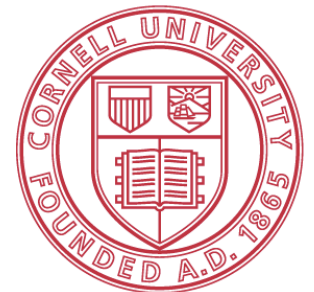
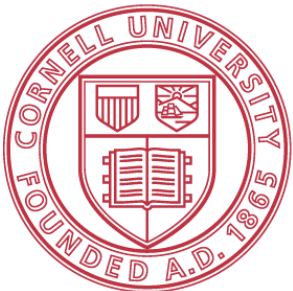


**Robert S. Weiss**

**Department of Biomedical Sciences**

**College of Veterinary Medicine**

**Cornell University**





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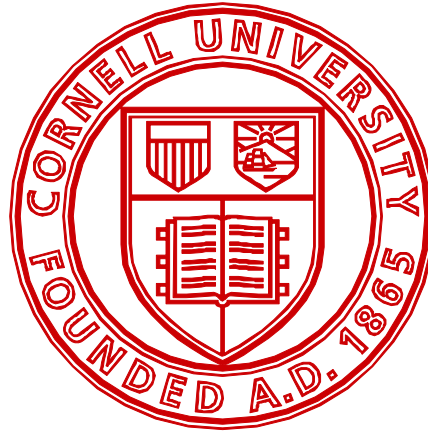
# Cancer in the headlines...

- ◆ Estimated cancer deaths in the U.S. in 2016: 314,290 men; 281,400 women



[www.acfoundation.org](http://www.acfoundation.org)

- ◆ Cornell President Elizabeth Garrett dies of colon cancer at age 52
- ◆ Vice-President Joseph Biden calls for 'a moonshot to cure cancer'
- ◆ Highly promising research advances
  - Genome Sequencing and Personalized Medicine
  - Targeted therapeutics
  - Immuno-therapies



LIFE  
SCIENCES

PHYSICAL  
SCIENCES,  
ENGINEERING

**Cancer research  
at  
Cornell University**

VETERINARY  
MEDICINE

HUMAN  
MEDICINE



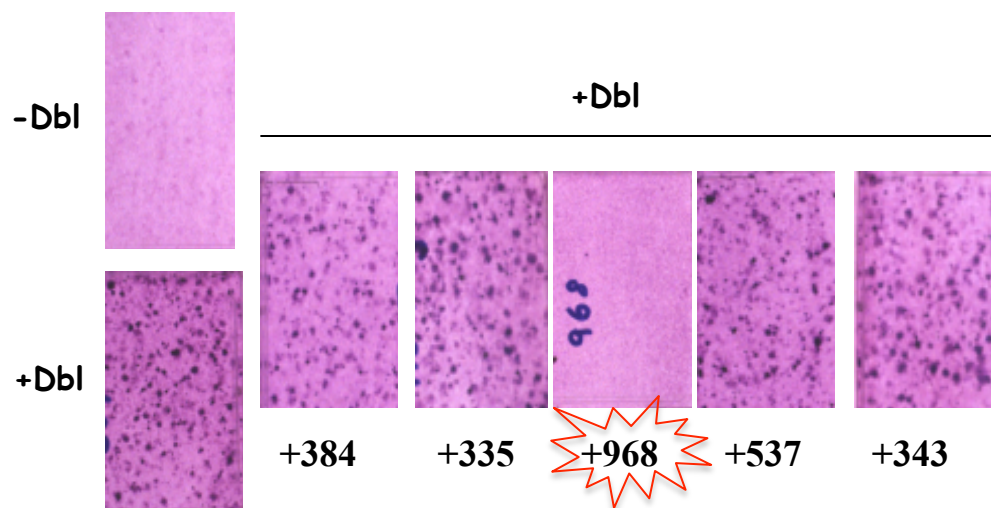


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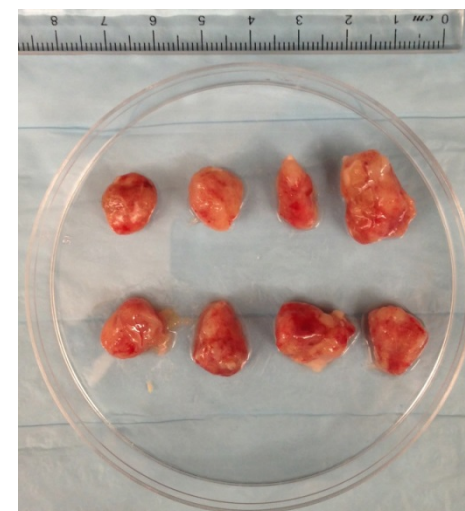


# Professor Rick Cerione

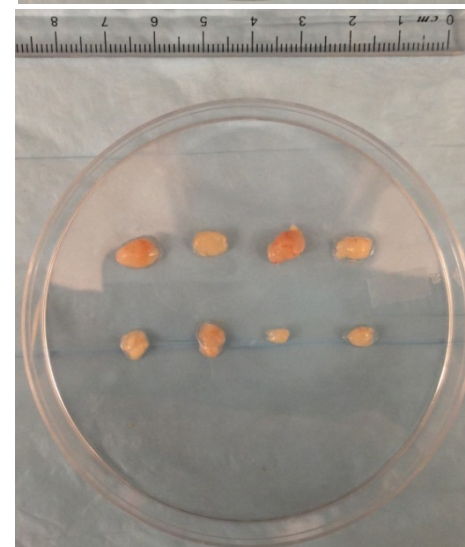
## An Inhibitor of Cancer Cell Metabolism



Control



968 + Avastin



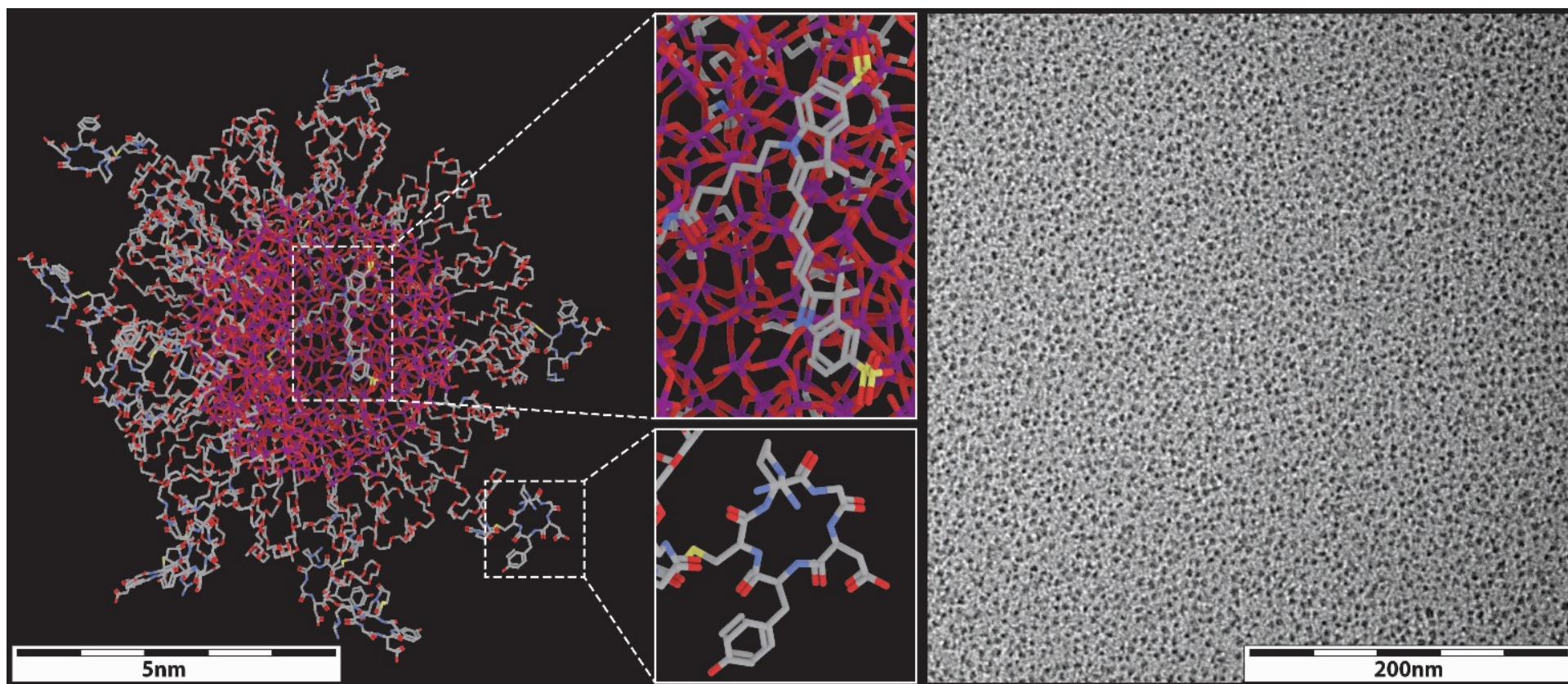


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## Professor Uli Wiesner

### Dual modality Cornell dots (C dots)



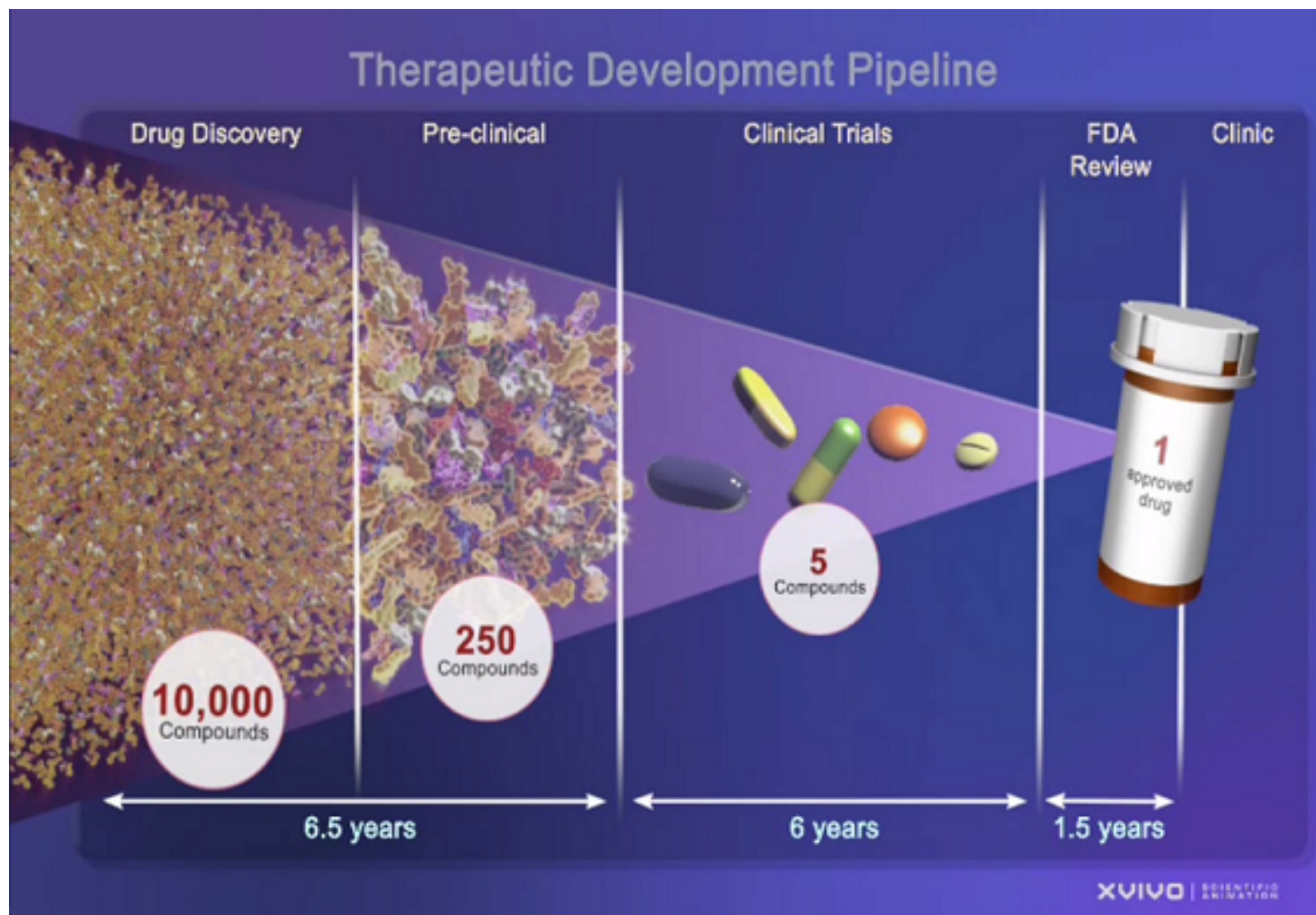
highly fluorescent objects of macromolecular size





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## Drug development is inefficient and expensive



Average  
cost to  
develop a  
new drug:  
\$2.6  
billion

<http://www.ncats.nih.gov/research/reengineering/process.html>



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# Progressive Assessment of Therapeutics (PATH)

Kristy Richards, MD, PhD

Leandro Cerchietti, MD

Human Clinical  
Trials

Clinical trials in canine patients with  
spontaneous tumors

PDX (primary human  
xenotransplantation)

GEMM (genetically  
engineered mouse models)

Massive High Throughput Primary Human Organoid Culture





# High Throughput 3D Human Organoid Culture

## ***The Challenges:***

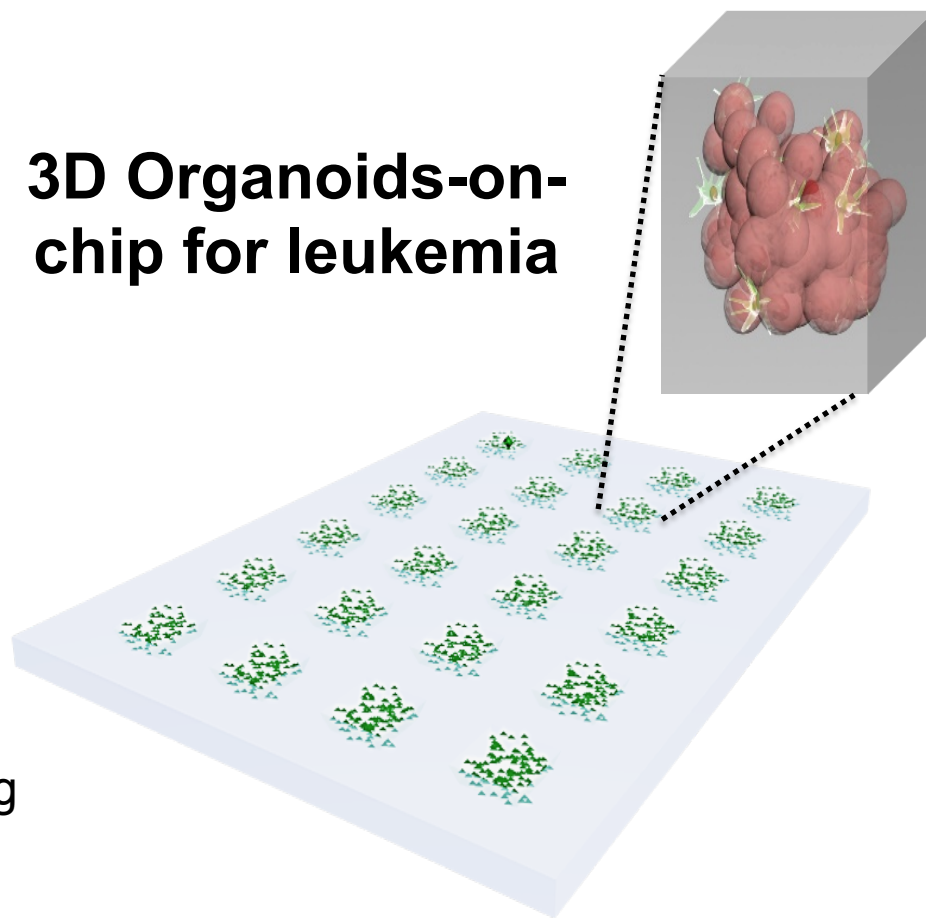
- Cancer cells often are difficult to culture.
- Traditional culture methods involve artificial conditions that alter the properties of the cancer cells.

## ***The Solution:***

Engineered 3D organoids that mimic the natural environment of the cancer.

- Amenable to large-scale drug screening
- Potential for individualized patient regimens based on their organoid readouts

## **3D Organoids-on-chip for leukemia**



Ankur Singh, PhD



## Advantages of Modeling Cancer in the Mouse

- Mouse biology is well characterized
- Genetic tools are well established
- Mice breed rapidly and are relatively short-lived
- Genetic similarity between mice and humans is high
- Mouse and human cancers arise through common molecular mechanisms and share similar histopathological features

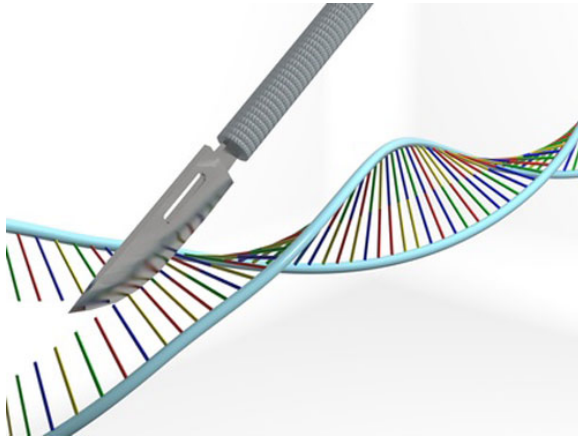




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# Genetically Engineered Mouse Models

*Genome editing*



+



- Precise genetic modifications
- Easy to perform
- Cost-effective

- Genetic manipulation of single-cell embryos

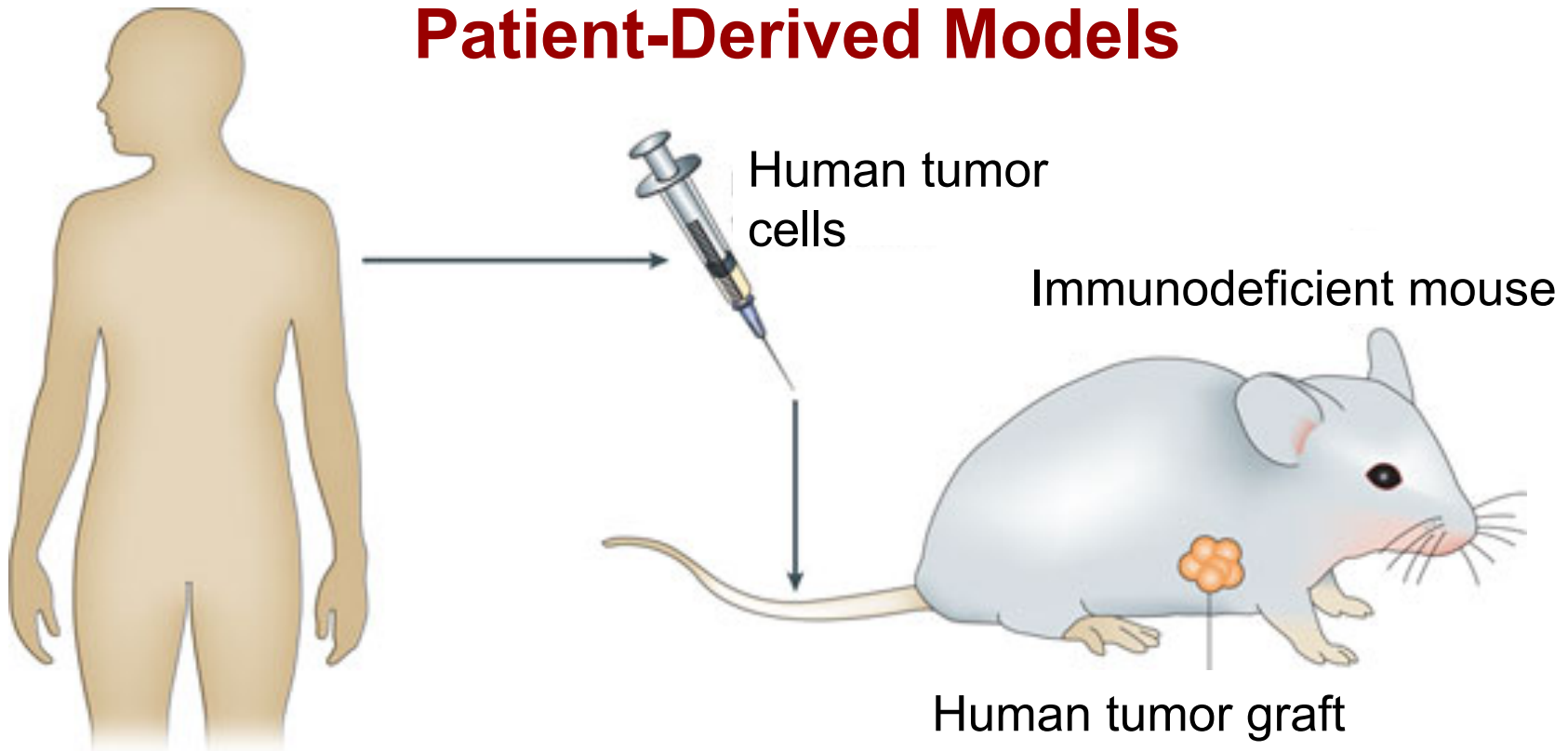


- Rapid production of mice with exactly the same mutations as are found in human cancers

John Schimenti, PhD



## Patient-Derived Models



- Engraftment of primary tumor tissues into immunodeficient mice
- Retention of genetic and phenotypic characteristics of the malignancy
- Rapid creation of large cohorts for monitoring the effectiveness of therapeutics





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## Pets as Animal Models



Desktop wallpaper by Anthem. Photography by Anna Geddes





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## Why Study Lymphoma in a Veterinary Clinic?



- One of the most common cancers in dogs
- Similarities to humans that cannot be reproduced in mice
- High-risk breeds with lymphoma predisposition genes
- A win-win situation for veterinary and human medicine



## Clinical Trials in Dogs and Humans

- Cooperative Groups Trials
  - Humans – Alliance
  - Dogs – Comparative Oncology Trials Consortium
- Dogs Augment Human Studies
  - More patients
  - Not constrained by typical Phase I/II/III design
  - Rapid disease progression yields answers quickly
  - Addresses major needs of veterinary patients



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## A different paradigm

The way things have historically been done:



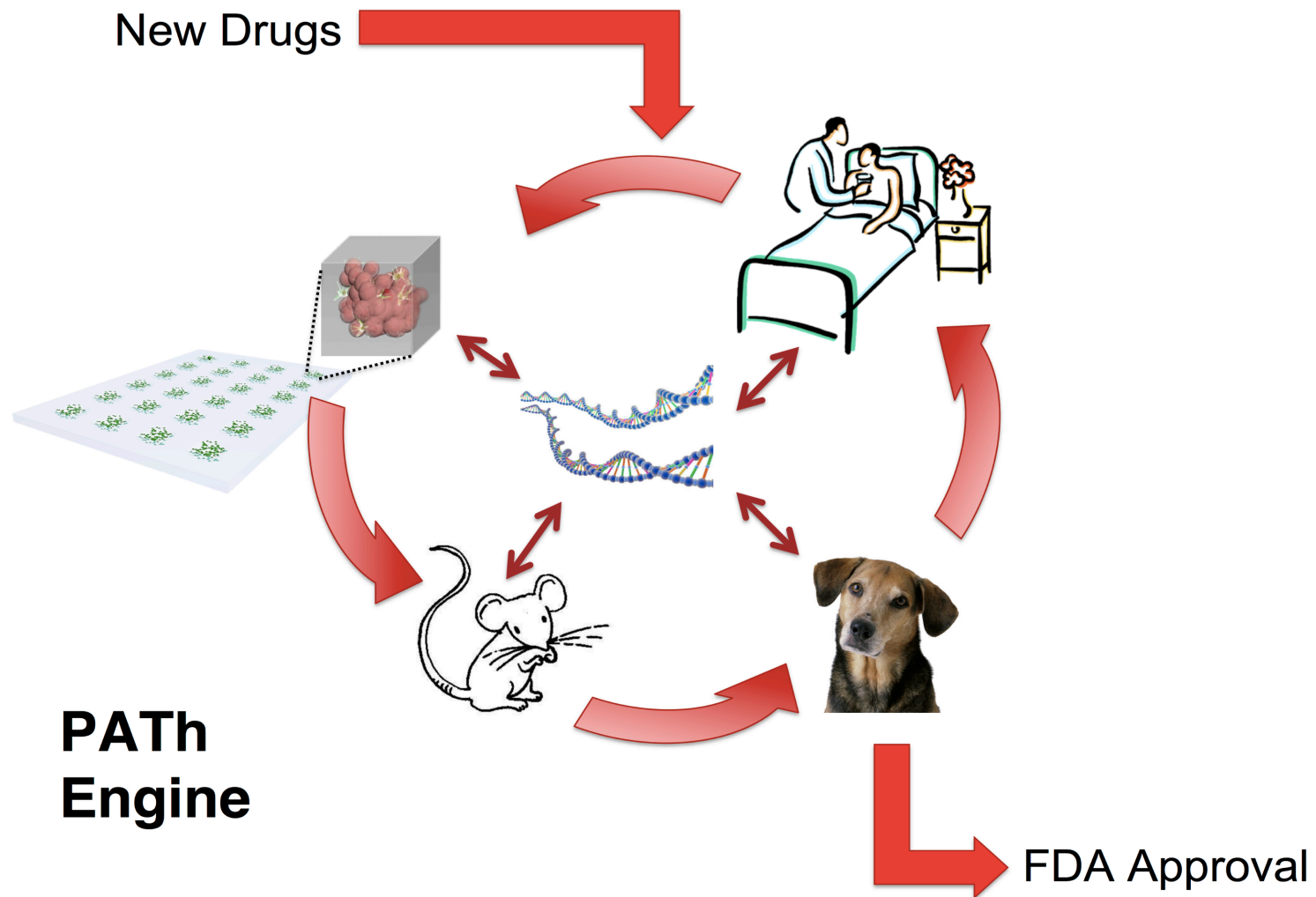
A better strategy:





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# Progressive Assessment of Therapeutics (PATH)







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## Partnership with the Cancer Resource Center of the Finger Lakes

- ◆ Monthly educational workshops on cancer
- ◆ Participation of trainees in support group meetings



### Cornell University Town-Gown (TOGO) Award



December 2013

#### CORNELLCHRONICLE

October 14, 2014

Science, Tech & Medicine

Arts & Humanities

Business, Law & Society

Campus Life

Archive

Sept. 11, 2014

#### Cornell cancer researchers listen to patients' stories

By *Natalie O'Toole*

The Ithaca Voice (<http://ithacavoice.com/2014/10/cancer-resource-center-finger-lakes-collaborates-cornell-university/>)

#### Cancer Resource Center of the Finger Lakes Collaborates with Cornell University

By: LYNDSAY ISAKSEN | October 2, 2014



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# Engaged Cornell

Engaged Cornell is a major initiative to advance the university's mission through community-engaged learning and discovery.





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# Community Engagement by Cancer Scientists

## Objectives

- Provide trainees skills in science communication and expose them to the patient perspective on issues in cancer biology
- Provide community members information about cancer and Cornell research, as well as a forum to engage with cancer scientists

## Our Engaged Cornell Team

- Bruce Lewenstein & Lauren Chambliss, Department of Communication
- Kristy Richards & Bob Weiss, Department of Biomedical Sciences
- Graduate Students Peter DeNero and Alex McGregor
- Bob Riter, Cancer Resource Center of the Finger Lakes





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## **A New Curriculum in Community Engagement and Public Communication by Cancer Scientists**

### **COMM 5660: Science Communication Workshop**

An introduction to effective communication of science and technology to non-scientists

### **COMM 5665: Science Communication Practicum**

Hands-on training in scientific information communication to public audiences, including writing and oral presentation.

### **BIOMS 5660: Social Issues in Community Engagement by Cancer Scientists**

Workshop on social issues of relevance to cancer patients: the economics of healthcare; health disparities; community-based cancer advocacy; and patient rights and privacy.

### **BIOMS 5665: Community-based Cancer Research Presentations & Discussions**

Weekly series with student presentations on research topics as well as outside speakers from various cancer-related areas

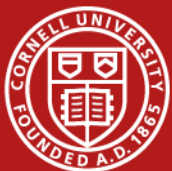


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Students who complete all 4 courses receive a  
Cornell Graduate Certificate of Engagement in  
Public Communication of Science & Technology

More information available at:

<http://cancer.cornell.edu/education.html>



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# Engaged Cornell Workshop

## Social Issues in Community Engagement by Cancer Scientists

Sean Nicholson: Economics of cancer drugs and care

Beverly Canin: Community-based cancer advocacy

Kristy Richards: Clinical trials, patients as research subjects

Valerie Reyna: Medical Decision Making

Phillip Owh: Intellectual property and patents

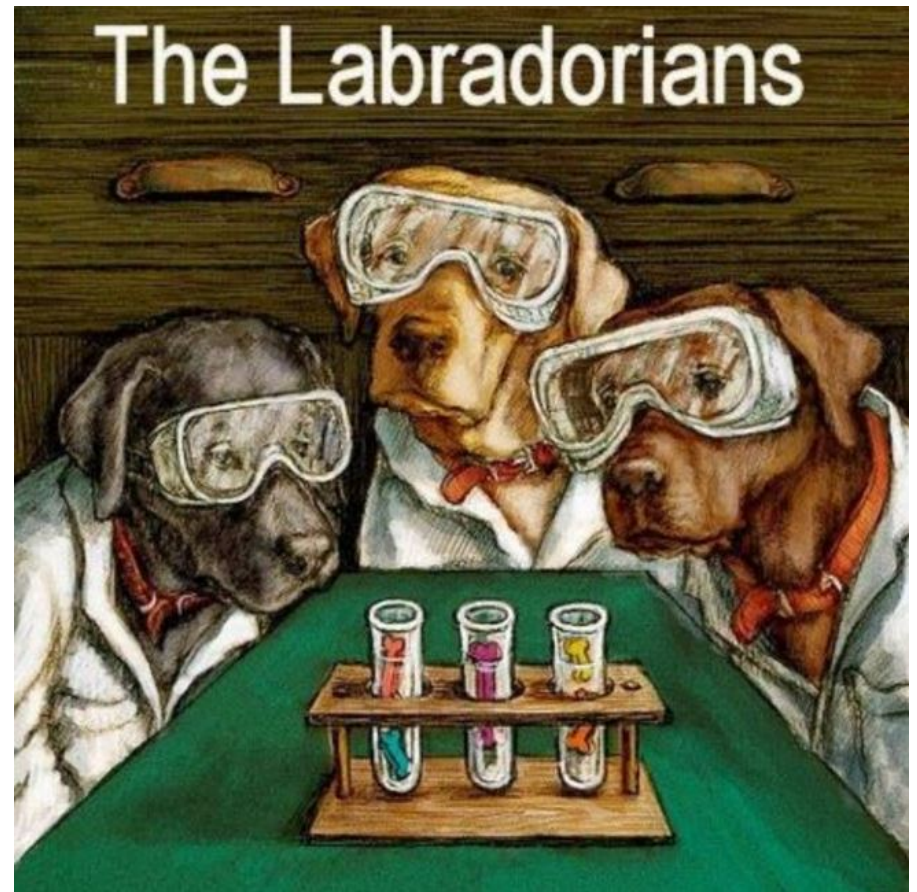
Student interviews of  
community members

Panel Discussion with cancer  
patients and survivors

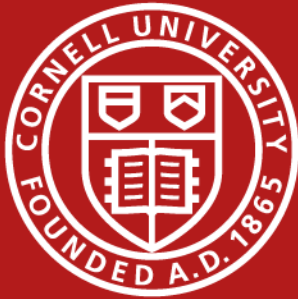


# Comparative Oncology Today

- Pet dogs are a means of discovering important and relevant information about human malignancies at the same time as we learn about canine malignancies
- With genomic tools in hand, the dog becomes an even more accessible model: “comparative oncogenomics”
- Pet dogs should be incorporated into clinical trials, to the benefit of both humans and dogs







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